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The Impact of Acoustic Neuroma on Long-term Quality-of-Life Outcomes in the United Kingdom
Running TITLE: QOL of patients with Acoustic Neuroma.

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Compliance with Ethical Standards

Disclosure of potential conflict of interest: the authors declare that they have no conflict of interest.

Research involving human participants: All procedures performed in studies involving human participants were in accordance with the ethical standards of the institutional and/or national research committee and with the 1964 Helsinki declaration and its later amendments or comparable ethical standards.

Informed consent: patients consented their participation in the project by filling in the questionnaires after an invitation was sent by email.

Funding: The British Acoustic Neuroma Association provided a grant to support the SurveyMonkey subscription for one year.

Abstract (158 words)
Objective: To quantify the impact of acoustic neuroma on the quality-of-life patients in the United Kingdom.

Study design: Online questionnaire survey.

Patients: Members of the British Acoustic Neuroma Association received PANQOL questionnaires.

Results: Of the 880 BANA members contacted, 397 (45.1%) responded, although only 359 had complete datasets for analysis. Composite quality-of-life scores were as follows: for microsurgery 58 (SD 35), for radiotherapy 56 (SD18), for combination of surgery and radiotherapy 49 (SD 14), and for the observation group 54 (SD 20). No statistical significance with ANOVA (p=0,532). Mean (SD) composite quality-of-life scores were as follows: for follow-up <6 52 (SD 18), for follow-up 6-10 55 (SD 20) and follow-up >10 years 65 (SD 45). Overall, these values were significantly different compared by ANOVA (p<0.001). Patients with facial paralysis showed no statistical significant differences between the different treatment groups.

Conclusions: Short (<6 years) and long-term (>10 years) quality-of-life outcomes show no significant differences between the different treatment groups.

KEY WORDS: PANQOL, acoustic neuroma, vestibular schwannoma, treatment outcomes, quality of life.

INTRODUCTION

Although acoustic neuroma (AN) has a significant impact on patients' overall quality-of-life, comparing outcomes in the management of AN can be challenging. Frequently used study endpoints have included tumour growth rate, need for subsequent intervention, facial nerve function, hearing status, tinnitus, and vertigo/imbalance. Far fewer studies have evaluated the impact of AN on general well-being and quality-of-life (QOL). A systematic review identified 47 studies utilising a variety of patient-reported outcome measures; the most frequently used being the Short Form-36 (SF-36) questionnaire and Glasgow Benefit Inventory (GBI) [1,2]. Comparison across studies was confounded by the different QOL-tools utilised and none were validated specifically for AN. Other studies have focused on specific functional problems such as swallowing, balance and facial paralysis and how these complications might affect overall well-being[3].

The Penn-Acoustic-Neuroma-Quality-of-Life (PANQOL) scale is the only AN specific QOL instrument, which is validated for both English and Dutch-speaking patients[4,5]. This 26-item survey assesses patient-perceived QOL in seven domains: hearing, balance, facial symptoms, anxiety, energy, pain, and general health. Questions on the PANQOL are answered on a scale from 1 to 5. These domain scores are then converted to a scale of 0 to 100 (lowest to highest QOL) for ease of reporting. A composite quality-of-life (cQOL) score is calculated from the averages of individual domain scores and is also reported on a scale of 0 to 100.

The British Acoustic Neuroma Association (BANA) was formed in 1992 as a charity to support people who have been diagnosed with AN. BANA members participated in an earlier survey to assess the psychological distress, the ways of coping with that stress, and the self-esteem of patients with facial paralysis after AN surgery[6]. While there was no association between the level of distress and the grade of facial paralysis, female gender and young age correlated with higher level of distress, lower self-esteem and maladaptive coping behaviour. However, the overall impact of AN on QOL was not evaluated in this study.

To effectively implement shared-decision making into the AN-management, it is important that patients are given information not only about the chances of success and failure, but also about the QOL and distress they can expect. The aim of this study was to evaluate the QOL impact on British AN patients, whether there were long-term differences in patient-perceived QOL between different treatment modality and whether QOL significantly changed over time within each of the different treatment groups.

METHODS

Ethical considerations

This survey was approved by the Department of Clinical Audit and Information (reference 3079) of our institution.

Data collection

The BANA board of trustees was involved throughout the design of this cross-sectional, point-in-time observational survey[3]. The online link to SurveyMonkey (www.survey monkey.com) was emailed to the members of BANA who were on the association emailing list and a reminder was sent 4 weeks later[3]. In addition to the PANQOL, the SurveyMonkey online questionnaire surveyed patient demographics (age ranger, gender), type of AN-management and when treatment started. No identifying information (such as name, date of birth, email or internet protocol address) was collected, thus the responses were completely anonymous.

The forced responses to treatment received for AN were simplified to MS (microsurgery), RT (single or multiple radiotherapy/stereotactic radiosurgery/gamma knife), OBS (observation with interval MRI scanning) and COMBO (combination of MS and RT). For the MS and RT groups, follow-up defined as years since intervention, while follow-up for the OBS group was calculated as years since diagnosis. To assess any temporal differences in QOL, each treatment group was subdivided into short-, medium- and long-term follow-up which was defined as <6, 6-10 and >10 years follow-up respectively.

Information on tumour size and type of surgical approach (translabyrinthine, middle cranial fossa, retrosigmoid) was not collected as it was agreed with the BANA council that such data would not be routinely available from the majority of its members.

Calculating PANQOL domain scores

The analysis of total and domain scores in this study follow previously described in literature[7]. Briefly, individual scores were transformed to a 0- to 100-point scale: a response of 1 received 0 points, 2 received 25 points; 3 received 50 points; 4 received 75 points; and 5 received 100 points. All responses, except item 25, "My health is excellent", were reverse scored so that a higher value indicates better QOL. Domain scores for anxiety, facial function, general health, balance, hearing, energy, and pain were obtained by averaging the responses of items assigned to the respective domain.

A composite QOL (cQOL) score was calculated as the equal average of the seven domain scores. As such the domain scores and the total score could range from 0 to 100, with higher scores indicating better QOL[7]. The cQOL data reported here was stratified according to treatment and also to duration of follow-up (<6, 6-10, and >10 years). The total PANQOL questionnaire, used formula and categorisation into the seven domains are shown in Tables 1 and 2.

Statistical analysis

The data collected on SurveyMonkey was exported to an Excel (Microsoft, Inc. CA, USA) spreadsheet. Domain (anxiety (A), facial symptoms (F), general health (GH), balance (B), hearing (H), energy (E) and pain (P)) scores were calculated. These domain scores were then used to calculate a total composite score (cQOL). Statistical analysis was performed using the SPSS version 23 software (IBM, New York, USA). Shapiro-Wilk normality test were undertaken to determine the distribution of data. The treatment specific PANQOL composite and domain scores were compared using unpaired t-test. Within each treatment group, ANOVA and t-test also compared QOL scores among the three time intervals. A $p<0.05$ was regarded as being statistically significant.

RESULTS

Of the 880 members contacted, 397 (45.1%) responses were received. Thirty-eight patients (9.6%) were excluded for having incomplete data. Thus, a total of 359 (40.8%) BANA members with complete data sets were available for analysis in this study (Table 3).

Composite quality-of-life (cQOL) score by treatment modality

Overall, there were 185 patients in the MS, 94 in the RT, 63 in the OBS and 17 in the COMBO group. The mean (standard deviation, SD) cQOL scores for the various groups were as follows: MS 58 (SD 35), RT 56 (SD 18), COMBO 49 (SD 14) and OBS 54 (SD 20). These differences were not statistically significant when compared by ANOVA (p=0.532). There was also no statistically significant difference (unpaired t-test) when individual treatment groups were compared.

Composite quality-of-life (cQOL) score by follow-up period

When the study cohort was stratified according to follow-up period, there were 198 respondents in the short- (<6 years), 68 in the medium- (6 – 10 years) and 93 in the long-term (>10 years) follow-up group. Mean (standard deviation, SD) cQOL scores were as follows: for short- 52 (SD 18), for medium- 55 (SD 20) and for long-term follow-up groups 65 (SD 45). Overall, these values were significantly different compared by ANOVA (p<0.001). However, comparing the groups individually with unpaired t-test no significantly difference was detected (p=0.053 between short and long-term follow-up).

Table 4 shows cQOL by treatment group and mean years since treatment. No significant difference was found within the long-term follow-up.

PANQOL domain scores by treatment modality

The mean (standard deviation, SD) domain scores of the overall study cohort were as follows (Figure 1): anxiety (A) 63 (SD 26), facial function (F) 64 (SD 25), general health (GH) 57 (SD 22), balance (B) 50 (SD 22), hearing (H) 45 (SD 23), energy (E) 48 (SD 25) and pain (P) 57 (SD 33).

Both facial and balance domains showed significant differences (unpaired t-test) between the treatment groups. In the facial domain, RT (mean QOL 73, SD 22) reported better QOL (with p=0.015) than MS (mean QOL 57, SD 26) and also treatment group OBS (mean QOL 74, SD 21) reported better QOL (with p=0.019) than MS (mean QOL 57, SD 26). In the balance domain OBS (mean QOL 54, SD 25) reported better QOL (with p=0.046) than MS (mean QOL 50, SD 21) and OBS (mean QOL 54, SD 25) reported better QOL (with p=0.038) than COMBO (mean QOL 42, SD 18).

PANQOL domain scores by follow-up period

cQOL scores according to treatment groups, divided by follow-up are illustrated in Figure 2. Amongst the follow-up groups, the domain QOL scores were highest in the long-term follow-up group and lowest in the short-term follow-up group (except for the facial domain where medium follow-up after treatment scored the lowest). Comparing the domain groups individually divided by the follow-up groups with unpaired t-test, statistically significant difference was detected within the facial domain. The short-term follow-up group (mean QOL 64, SD 23) showed a better QOL (with p=0.002) than the medium-term follow-up group (mean QOL 62, SD 28). However, the long-term follow-up QOL (mean QOL 66, SD 28) was significantly higher (p=0.002) than the QOL scores within the short-term follow-up group (mean QOL 64, SD 23). The energy domain showed a significant difference in QOL (p=0.02) between the short-term follow-up group (mean QOL 45, SD 23) and the long-term follow-up (mean QOL 55, SD 26).

PANQOL domain scores by follow-up period

The mean QOL per domain subdivided by follow-up and treatment is showed in table 5. Looking at the differences of QOL divided by treatment and follow-up the only significant differences found were in the facial domain >10 years after treatment with higher QOL in the OBS (mean QOL 96, SD5) and RT (mean QOL 82, SD 18) compared to MS (mean QOL 61, SD 28) with p=0.006 and p=0.031 respectively. Within the domain H, B and F no differences were found <6 and 6-10 years after treatment.

DISCUSSION

To date, this is the first study focusing on quality of life issues reported by a large cohort of acoustic neuroma (AN) patients from across the United Kingdom who are members of BANA. The data presented here is unique as it is not specific to any institution and provides a snapshot of how AN patients are suffering. The result from this PANQOL survey corroborate with other studies that acoustic neuroma has an adverse effect on quality of life. Even those who were managed conservatively (OBS) reported comparable PANQOL scores as those who had either surgery (MS) or radiotherapy (RT).

Unlike previous studies which sampled patients within a single institution, this study has surveyed a larger selection of patients across the United Kingdom who were members of BANA. Anxiety domain scores were elevated for all groups which suggests that many patients continue to have significant concerns and unmet needs regarding their AN treatment. Interestingly, there was no statistically significant difference in composite QOL scores between the treatment cohorts in the individual follow-up intervals although some QOL domains scores did differ significantly. Short (<6 years) and long-term (>10 years) quality-of-life outcomes demonstrated no statistically significant differences between the different treatment groups. Domain scores of facial and balance show a significant difference between MS and RT ($p=0.019$ and 0.0046, respectively). No statistically significant differences were found between the group of patients suffering of facial paralysis both cQOL and facial domain QOL were lower compared to the patients without a facial paralysis. In addition, treatment of the facial paralysis did not result in a significant higher cQOL/facial domain QOL score. These observations may represent differences in treatment outcomes achieved by individual skull base units and available local expertise to deal with complications such as facial paralysis and disequilibrium, which underscores the importance of local departmental audit and participation in national clinical outcome reviews.

Table 6 shows the number of patients studied and which treatment they received together with the main conclusions for the 3 other studies using PANQOL-questionnaires. In contrast to the findings of Robinett et al[2] we found no statistically significant differences in cQOL >10 years following treatment.

Our results showed no differences in the balance domain scores when compared between the different treatment and follow-up groups. These findings are in contrast to the results of Carlson et al[8], as they showed significant differences in the facial, balance, pain and cQOL in multivariate analysis, all in favour of the observation group and non-tumour controls. This may be explained by treatment selection bias or the fact that our research designs is cross-sectional, with a point-in-time observational study. Possibly the patients who returned the questionnaires were by coincidence a selection of patients with certain complaints and outcomes, as only 45.1% returned their answers.

Several important considerations warrant attention when assessing the results of this survey. Firstly, the membership of BANA is unlikely to be representative of the spectrum of AN-patients in the U.K. Admittedly; those who have a good treatment outcome do not remain engaged in support groups such as the BANA but return to their daily lives. The distribution of respondents in the treatment groups perhaps reflects the bias from a survey such as this. Those patients who maintain active membership are typically those who have experienced complications and benefit from the support provided by BANA. Secondly, a group more biased toward a negative outcome such as those with facial paralysis or vestibular dysfunction is more likely to respond to a survey like this. Third, less than half of eligible respondents (40.8%) returned the questionnaire which was comparable to previous surveys. And finally, due to the study design, longitudinal data was not available. Therefore, no benefit of treatment could be determined.

These observations may explain why the mean cQOL score in the present study was lower than that reported by previous authors. Patients treated with both stereotactic radiosurgery and microsurgery may have had bigger tumours and therefore worse QOL-outcomes. As patients were not surveyed prospectively but rather a particular point-in-time, temporal trends in QOL were not assessed. Furthermore, data on tumour size was not collected in this study and thus how this variable correlate with QOL was not evaluated. Despite these limitations the results presented here are valuable as it provides baseline data for audit and provides the basis for larger, prospectively database such as the British Skull Base Society Vestibular Schwannoma Audit.

CONCLUSIONS

Short (<6 years) and long-term (>10 years) quality-of-life outcomes show no significant differences between the different treatment groups. Prospective, longitudinal studies utilising the PANQOL would better inform on the rehabilitation and support required by AN-patients.

MANUSCRIPT WORD COUNT: 2351

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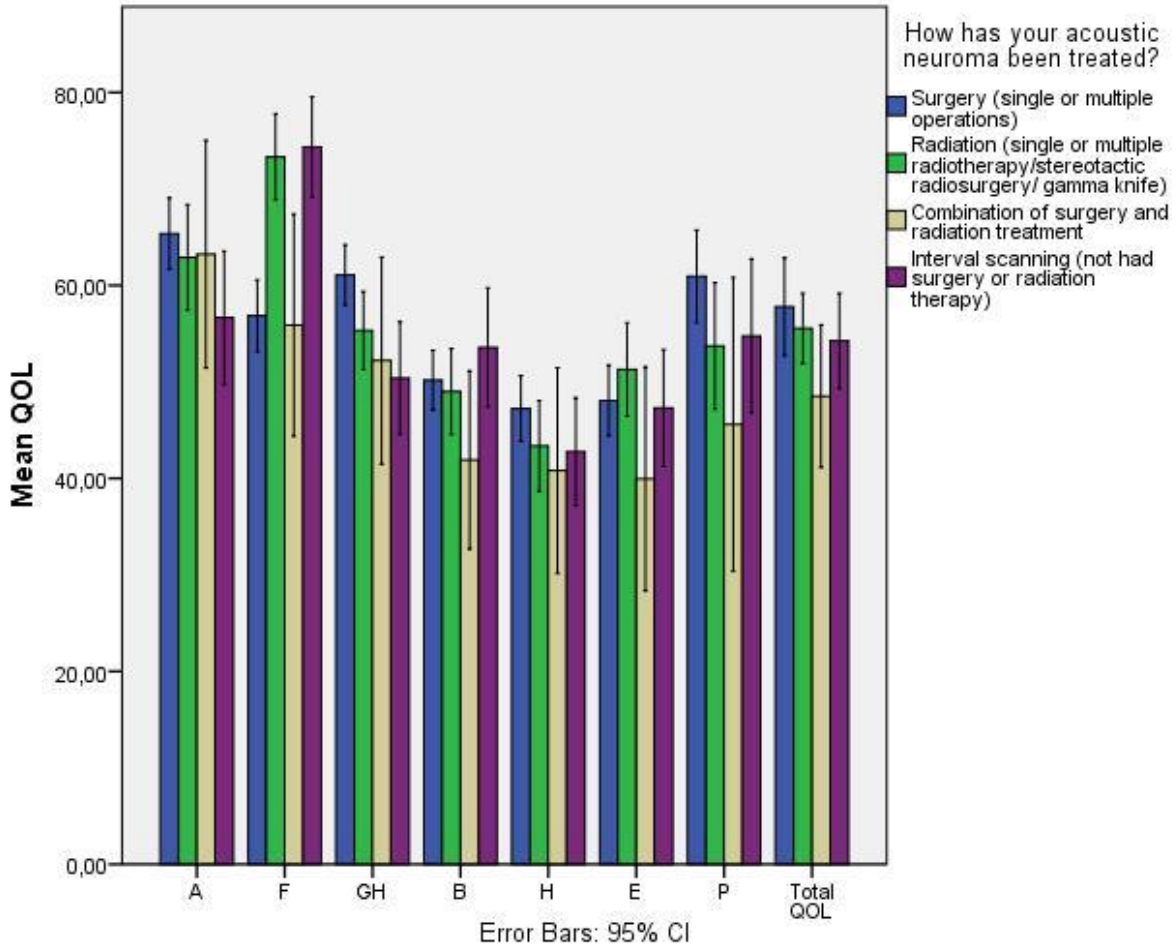
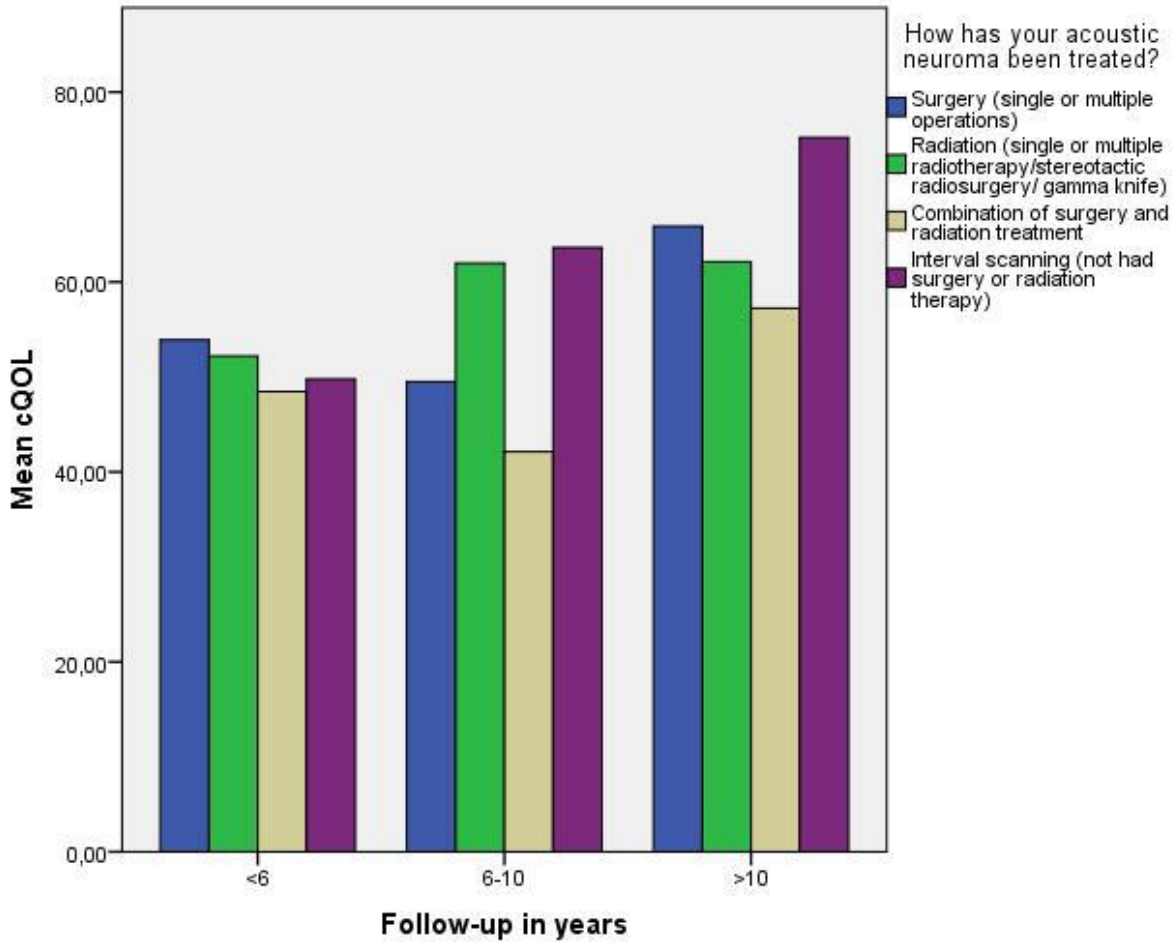
Figure 1. Distribution of domain QOL scores according to treatment groups



This figure shows the mean quality-of-life (QOL) scores for each domain score A (anxiety), F (facial symptoms), GH (general health), B (balance), H (hearing), E (energy) and P (pain) according to treatment groups.

Figure 2. cQOL scores according to treatment groups, divided by follow-up.



This figure shows the mean composite quality-of-life (cQOL) scores according to treatment groups for the different follow-up groups.

Table 1. PANQOL questionnaire and formula for QOL calculation.

Item	Strongly disagree	Disagree	Neutral	Agree	Strongly agree
1. Hearing loss has affected my personal relationships.	1	2	3	4	5
2. I have difficulty carrying on a conversation because of hearing loss.	1	2	3	4	5
3. My concentration is affected by ringing, hissing or other noises in my ears.	1	2	3	4	5
4. I have significant problems with dizziness.	1	2	3	4	5
5. I feel unsteady or off balance.	1	2	3	4	5
6. I feel a sense of whirling or falling when standing or walking.	1	2	3	4	5
7. Because of dizziness or imbalance, I have difficulties with changing direction while walking.	1	2	3	4	5
8. I have difficulties walking around my house in the dark.	1	2	3	4	5
9. Because of balance problems, I am afraid people will think I am intoxicated.	1	2	3	4	5
10. I act differently around people because of problems moving my face.	1	2	3	4	5
11. I have discomfort, itching or excessive tearing in one of my eyes.	1	2	3	4	5
12. My speech has been affected by problems with my face.	1	2	3	4	5
13. I accomplish less than I would like because of my diagnosis of acoustic neuroma.	1	2	3	4	5
14. I have problems with head pain on the side of my acoustic neuroma tumor.	1	2	3	4	5
15. I get a sort of frightened feeling as if something awful is about to happen.	1	2	3	4	5
16. Worrying thoughts go through my mind.	1	2	3	4	5
17. I feel as if I am slowed down.	1	2	3	4	5
18. I get a sort of frightened feeling like “butterflies” in the stomach.	1	2	3	4	5
19. I get sudden feelings of panic.	1	2	3	4	5
20. I often feel isolated as a result of my diagnosis of acoustic neuroma.	1	2	3	4	5
21. I have had difficulty concentrating on things, like reading a newspaper or watching television.	1	2	3	4	5
22. I have become more impatient.	1	2	3	4	5
23. I am lacking in energy or vitality.	1	2	3	4	5
24. I have difficulty remembering things.	1	2	3	4	5
25. My health is excellent.	1	2	3	4	5
26. I expect my health to get worse in the coming year.	1	2	3	4	5

Domains:

Anxiety	Items 15,16,18,19
Facial dysfunction	Items 10,11,12
General health	Items 25,26
Balance	Items 4,5,6,7,8,9
Hearing loss	Items 1,2,3,20
Energy	Items 13,17,21,22,23,24
Pain	Item 14

Individual scores will be transformed to a 0- to 100-point scale.
First all scores will be reversed, except item 25, so that a higher score will indicate better QOL.

A response of 1 will receive 0 points, 2, 25 points; 3, 50 points; 4, 75 points; and 5, 100 points.

Domain scores are obtained by averaging the responses of items assigned to the domain. A total score is calculated as the equal average of the 7 domain scores.
As such the domain scores and the total score could range from 0 to 100, with higher scores indicating better QOL.

Table 2. PANQOL questionnaire with diversion and points.

Item	Strongly disagree	Disagree	Neutral	Agree	Strongly agree
1. Hearing loss has affected my personal relationships.	100	75	50	25	0
2. I have difficulty carrying on a conversation because of hearing loss.	100	75	50	25	0
3. My concentration is affected by ringing, hissing or other noises in my ears.	100	75	50	25	0
4. I have significant problems with dizziness.	100	75	50	25	0
5. I feel unsteady or off balance.	100	75	50	25	0
6. I feel a sense of whirling or falling when standing or walking.	100	75	50	25	0
7. Because of dizziness or imbalance, I have difficulties with changing direction while walking.	100	75	50	25	0
8. I have difficulties walking around my house in the dark.	100	75	50	25	0
9. Because of balance problems, I am afraid people will think I am intoxicated.	100	75	50	25	0
10. I act differently around people because of problems moving my face.	100	75	50	25	0
11. I have discomfort, itching or excessive tearing in one of my eyes.	100	75	50	25	0
12. My speech has been affected by problems with my face.	100	75	50	25	0
13. I accomplish less than I would like because of my diagnosis of acoustic neuroma.	100	75	50	25	0
14. I have problems with head pain on the side of my acoustic neuroma tumor.	100	75	50	25	0
15. I get a sort of frightened feeling as if something awful is about to happen.	100	75	50	25	0
16. Worrying thoughts go through my mind.	100	75	50	25	0
17. I feel as if I am slowed down.	100	75	50	25	0
18. I get a sort of frightened feeling like “butterflies” in the stomach.	100	75	50	25	0
19. I get sudden feelings of panic.	100	75	50	25	0
20. I often feel isolated as a result of my diagnosis of acoustic neuroma.	100	75	50	25	0
21. I have had difficulty concentrating on things, like reading a newspaper or watching television.	100	75	50	25	0
22. I have become more impatient.	100	75	50	25	0
23. I am lacking in energy or vitality.	100	75	50	25	0
24. I have difficulty remembering things.	100	75	50	25	0
25. My health is excellent.	0	25	50	75	100
26. I expect my health to get worse in the coming year.	100	75	50	25	0

Domain scores:	
Anxiety	((15 + 16 + 18 + 19)/4)
Facial dysfunction	((10 + 11 + 12)/3)
General health	((25 + 26)/2)
Balance	((4 + 5 + 6 + 7 + 8 + 9)/6)
Hearing loss	((1 + 2 + 3 + 20)/4)
Energy	((13 + 17 + 21 + 22 + 23 + 24)/6)
Pain	((14)/1)
	Total score: (sum of all domain outcomes)/7

Scores from 0 to 100, with higher scores indicating better QOL.

Table 3. Summary of demographic and clinical data.

		N (%)
Sex		
	Male	131 (36.5%)
	Female	228 (63.5%)
Age distribution (year)		
	<21	0
	21-30	1 (0.3)
	31-40	26 (7.2)
	41-50	53 (14.8)
	51-60	102 (28.4)
	61-70	137 (38.2)
	71-80	34 (9.5)
	81-90	6 (1.7)
	>90	0
Follow-up after treatment	Mean 7.0	
	< 6 years	198
	6-10 years	68
	>10 years	93
Treatment for acoustic neuroma		
	Surgery (single or multiple operations)	185 (51.5)
	Radiation (single or multiple radiotherapy/stereotactic radiosurgery/gamma knife)	94 (26.2)
	Combination of surgery and radiation treatment	17 (4.7)
	Interval scanning (not had surgery or radiation therapy)	63 (17.5)

Table 4. Demographics by treatment group and years since treatment

	Treatment groups											
	MS (n=185)			**RT (n=94)**			**COMBO (n=17)**			**OBS (n=63)**		
	<6 n=80	6-10 n=33	>10 n=70	<6 n=62	6-10 n=18	>10 n=14	<6 n=10	6-10 n=4	>10 n=3	<6 n=46	6-10 n=13	>10 n=4
Mean follow-up (years)	2.2	8.2	16.9	2.0	7.4	16.6	2.3	8.5	13.3	1.7	8.1	12.0
Mean cQOL	53.9	49.5	66.7	52.2	62.0	62.1	48.5	42.1	57.2	49.8	63.6	75.2

MS = microsurgery, RT = Radiation (single or multiple radiotherapy/stereotactic radiosurgery/gamma knife), COMBO = Combination of surgery and radiation treatment, OBS = Interval scanning (not had surgery or radiation therapy), cQOL = composite Quality-of-life.

Table 5. Mean QOL subdivided by follow-up group and domain scores.

Follow-up	Treatment	Domain	A	F	GH	B	H	E	P
< 6 years	MS (n=80)		61	57	61	49	45	45	58
	RT (n=62)		61	59	55	45	40	48	48
	COMBO (n=10)		62	55	55	43	44	35	45
	OBS (n=46)		52	71	46	50	41	42	48
6-10 years	MS (n=33)		59	47	53	43	43	42	60
	RT (n=18)		68	81	56	58	49	61	61
	COMBO (n=4)		58	48	47	36	33	42	31
	OBS (n=13)		66	79	64	57	49	61	69
>10 years	MS (n=73)		73	61	64	55	52	54	64
	RT (n=14)		66	82	57	56	52	55	68
	COMBO (n=3)		75	69	50	44	40	56	67
	OBS (n=4)		84	96	59	85	45	69	88

MS = microsurgery, RT = Radiation (single or multiple radiotherapy/stereotactic radiosurgery/gamma knife), COMBO = Combination of surgery and radiation treatment, OBS = Interval scanning (not had surgery or radiation therapy), QOL = Quality-of-life. Domain A (anxiety), F (facial symptoms), GH (general health), B (balance), H (hearing), E (energy) and P (pain). The highest value within the domain score subdivided by each follow-up group is underlined. MS reached 5 times the highest score, whereas RT 7 times, COMBO 1 time and OBS 11 times.

Table 6. Summary of quality of life studies utilising PANQOL.

Article	Patients	Treatment (Microsurgery=MS) (Radiotherapy=RT) (Observation=OBS)	Time between treatment and survey (years)	Key findings	PANQOL scores
McLaughlin et al 2014[10]	186	MS 39 (21%) RT 49 (26.3%) OBS 98 (52.7%)	Mean 2.6	No significant difference between gamma knife and surgery group.	MS 64 RT 67 OBS 72
Robinett et al 2014[2]	279	MS 157 (56.3%) RT 43 (15.4%) OBS 79 (28.3%)	Mean 7.9	Long-term (>5 years) QOL outcomes by PANQOL show no significant differences between treatment groups.	Follow up 0-5 years: MS 86 RT 71 OBS 70 Follow up 6-10 years: MS 72 RT 78 OBS 71 Follow up >10 years: MS 71 RT 72 OBS 71
Carlson et al 2015[8]	642	MS 144 (22.4%) RT 247 (38.5%) OBS 148 (23%) Non tumour controls 103	Mean 7.7	Significant differences: MS vs. RT (p=0.004) MS vs. OBS (p=0.023)	MS 65 RT 70 OBS 72
This study	359	MS 185 (51.5%) RT 94 (26.2%) COMBO 17 (4.7%) OBS 63 (17.5%)	Mean 7.0	Significant differences: Facial domain QOL: RT vs. MS (p=0.015) OBS vs. MS (p=0.019) Balance domain QOL : OBS vs. MS (p=0.046) OBS vs. COMBO (p=0.038) Long-term vs. short-term follow-up groups: Significant differences for Facial and Energy domain	Follow-up 0-5 years: MS 54 RT 52 COMBO 49 OBS 50 Follow-up 6-10 years: MS 50 RT 62 COMBO 42 OBS 64 Follow-up >10 years: MS 67 RT 62 COMBO 57 OBS 75